

*Developmental Perspectives on Understanding  
and Responding to Mental Health Impacts  
of Climate Change on Young People*

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**Climate Change and the Mental Health of Young People**

As climate change alters the environments that human life, and all life, have evolved to survive in, many of its effects are now irreversible. Changes to land, oceans, and the atmosphere will persist for thousands of years, causing major disruptions to ecosystems and human societies. These changes are occasionally benign. But, mostly, they make the world a more stressful and dangerous place to grow up, and an emerging body of research shows that they are harming the mental health of young people. Much attention has focused on the question of how young people are responding psychologically to the threat of climate change – including the emotional states it elicits, such as feelings of fear, anxiety, anger, frustration, and guilt. Questions about the broader effects of climate change on youth mental health, which begin before birth and extend across the life course, remain under-studied. In this chapter, we argue that a holistic view that draws on a developmental life course perspective can help us appreciate the full dimensions and scope of the climate change burden, and thus better adapt and respond to the mental health challenges it brings.

The effects of climate change are now widely observable. Heatwaves, storms, droughts, floods, and wildfires are becoming more frequent, intense, unpredictable, and severe. Across most of the world, they are aggravating drought, food insecurity, infectious disease, biodiversity loss, displacement, and forced migration (Ebi et al., 2021; Romanello et al., 2021). But beyond geophysics, climate change and its effects are not easily defined or categorized. In this chapter, we refer to *climatic stressors*. These are the consequences of climate change that we observe and experience, such as severe weather events. Climatic stressors result in *exposures* to harm, which can range from mild to severe (Ebi et al., 2021). Exposures,

in turn, have *impacts*, defined as tangible consequences for mental health and well-being. These are also distributed along a continuum from mild to severe.

Similar challenges are raised by attempts to define the dimensions of mental health and illness. Here, we take a broad view of mental health that is not confined to the presence or absence of psychiatric diagnoses. It also includes states of healthy emotional, behavioral, and cognitive functioning, as well as states of psychological resilience and well-being. We thus view mental health as a general adaptive capacity (or vulnerability) that enables (or hinders) the flexible regulation of emotional, behavioral, and cognitive states in the face of life's day-to-day ups and downs (Hayes et al., 2018; Herrman, 2001).

While general and scientific awareness of the link between climate change and mental health is no longer new, the impacts on young people, especially when viewed across the life course, have been only rarely considered. This long-term perspective matters because mental health represents precious human capital – that is, the capacity to reach one's potential and participate fully in society. To the extent that climate change undermines mental health, it will also undermine the future capital of society. Indeed, the costs of poor mental health are well documented, especially for the young: mental health problems disrupt education, undermine employment, increase stigma, discrimination, and social isolation, and are associated with a higher incidence of lifetime health morbidities, including increased suicide risk and earlier death (WHO, 2021). Climate change is already increasing this burden, and it is therefore critical to better understand how this occurs so that effective adaptive and preventive action may be taken.

Young people represent a large and psychologically vulnerable population. People aged 0 to 24 years make up 41.0 percent of the global population, with 25.5 percent aged 0–14 and 15.5 percent aged 15–24 (UN, 2022). The peak age of onset for any mental disorder is 14.5 years and around two-thirds of all disorders are established by age 24 years (Solmi et al., 2021). In high-income countries, roughly one in eight children have mental disorders that cause symptoms and impairment at any given time (Barican et al., 2022). While reliable estimates from low- and middle-income countries are more difficult to obtain, a systematic review of six countries in sub-Saharan Africa reported that 14.3 percent of children aged 0–16 years had some psychopathology and around one in ten met criteria for a specific psychiatric disorder (Cortina et al., 2012). Furthermore, this burden is expected to rise as low- and middle-income countries follow the

sociodemographic trends of increasing living standards and better health already observed in high-income countries across the twentieth century (Baranne & Falissard, 2018).

The United Nations Children's Fund estimates that half of the world's 2.2 billion children are at "extremely high risk" from climate change due to disruptions to healthcare, education, food security, and other key resources (UNICEF, 2021). Children are also highly vulnerable to the physical health burden of climate change, including noncommunicable disease risks. Physical and mental health interact in important ways, and physical health and illness influence psychopathology risk (Firth et al., 2019). Compared to adults, young people, especially very young children, have less effective heat adaptation capacities, higher exposure to toxins per unit of body weight (e.g., water, air, and food-borne), and greater vulnerability to insect-borne vectors (Colón-González et al., 2021; Garcia & Sheehan, 2016). All of these are expected to increase with climate change. Furthermore, it is estimated that 89.3 percent of the world's young people aged 0–24 years live in low- and middle-income countries (UN, 2022), which are predominantly located in regions identified as being most vulnerable to the effects of climate change (Thiery et al., 2021).

Climate stressors are multiple, complex, interconnected, and ongoing. Weather-related extreme events, interacting with ongoing changes to underlying local climates (e.g., increasingly hotter summers), can harm a child's development from the start of life onwards, having additive, interactive, and cumulative effects on mental health vulnerability. Compared to older generations, young people also have more life years ahead in which to be exposed to the current and worsening impacts of climate change. Thus, by taking a developmental life course approach, it is possible to properly consider the effects of climate change that set young people on developmental trajectories that cascade across the life course and shape their mental health and illness. Indeed, a key reason for adopting such an approach is that it emphasizes the importance of early detection and prevention: the ideal point at which to intervene to mitigate risks and improve long-term outcomes, and to do so cost-effectively. It is towards this developmental perspective, as applied to mental health and illness, that we now turn.

### **Developmental Psychopathology**

Developmental psychopathology is a conceptual framework for understanding and studying the development of mental health and illness using a life course perspective. The concept gained prominence in psychiatric

**Textbox 4.1 Key concepts in developmental psychopathology**

- Development is the product of genetic, physiological, social, emotional, cognitive, behavioral, and cultural factors which change across time and in response to one another
- The timing, frequency, and intensity of early stressors can set children on developmental trajectories that can do lifelong harm to mental health and illness
- Development is nonlinear and early exposures can operate with additive, interactive, and cumulative effects to increase vulnerability across the life course
- Psychological development occurs within multiple nested contexts (e.g., individuals, within families, communities, and societies); and the interaction between these contexts
- Development is a process of adaptation, and what is adaptive in one context may not be adaptive in another context

research in the 1970s (Achenbach, 1974), and developed rapidly in the 1980s and 1990s to become an interdisciplinary field with broad applications in child development, clinical psychology, psychiatry, public health, and international development (Jaffee, 2019; Rutter, 1988). The approach emphasises the value of both normal and abnormal developmental processes in explaining the emergence of psychopathology and, importantly, views mental health problems as quantitative dimensions rather than qualitative categories (Martin et al., 2018) (Textbox 4.1).

A core assumption of the approach is that development is shaped by the dynamic interplay between physiological, genetic, cognitive, emotional, social, and environmental factors. Furthermore, the timing and sequence of exposure to early adversity and traumas (e.g., abuse, poverty, weather disasters) can have additive, interactive, and cumulative effects on development and set children on trajectories that increase mental health vulnerability across the life course (Beauchaine et al., 2018). More broadly, development is understood as an ongoing adaptive process that involves repeated transitions into new life phases. In other words, psychopathology emerges not as “a static set of diagnostic entities but rather as the product of the failure to obtain core developmental competences [and, we would add, resources], leading to a progressive veering from normal developmental trajectories and an accumulation of behavior patterns considered maladaptive in most contexts, even though at least some of these behaviors may have been adaptive in the context of deprived or harsh early environments” (Hinshaw, 2017).

Developmental psychopathology emphasizes relationships between biological, psychological, and social contexts that characterize human development. Ecological models have been used to describe the dynamic interacting nature of these processes (Noffsinger et al., 2012), to which we would stress the importance of adding built, natural and political environments (Berry et al., 2018). In the context of climate change, climatic stressors – such as storms, floods, droughts, and wildfires – could disrupt healthy development at multiple levels: the biological (e.g., stress-induced changes in DNA methylation and alteration of the body's stress-response system), the microsystem (e.g., increased family conflict), the mesosystem (e.g., disruptions to community social support and functioning), the exosystem (e.g., reduced access to key services), and the macrosystem (e.g., civil unrest, displacement). Importantly, these systems do not operate in isolation and are likely to interact in complex ways to increase vulnerability with additive, interactive and cumulative effects across development (Masten & Cicchetti, 2010) and, in turn, to contribute substantively to the multiple environments in which other children are also developing. This life course approach to development is being increasingly applied to physical health development as well.

To illustrate the relationship between climatic stressors and mental health across the early life course, it is helpful to consider several examples. Figure 4.1 shows how climatic stressors, which are becoming more frequent and severe with climate change, lead to direct and indirect exposures that can derail healthy physical and psychological development. For convenience, development is divided into four periods – (1) prenatal, (2) early childhood, (3) middle childhood, and (4) adolescence – based on both biological boundaries (e.g., birth, puberty) and socially defined transitions, such as entry into formal education. While exposure to climatic stressors can occur at any point along the developmental timeline, those that occur early, or are more severe and protracted, can set in motion developmental trajectories that cascade across the life course, particularly if both are the case. To better understand the vulnerabilities of each period, it is useful to consider several examples from each developmental period illustrated in the figure (Vergunst & Berry, 2021).

### *Prenatal Period*

The prenatal period is characterized by extremely high developmental vulnerability. An extensive literature describes the effects of exposure to stressors on embryonic and fetal development and subsequent

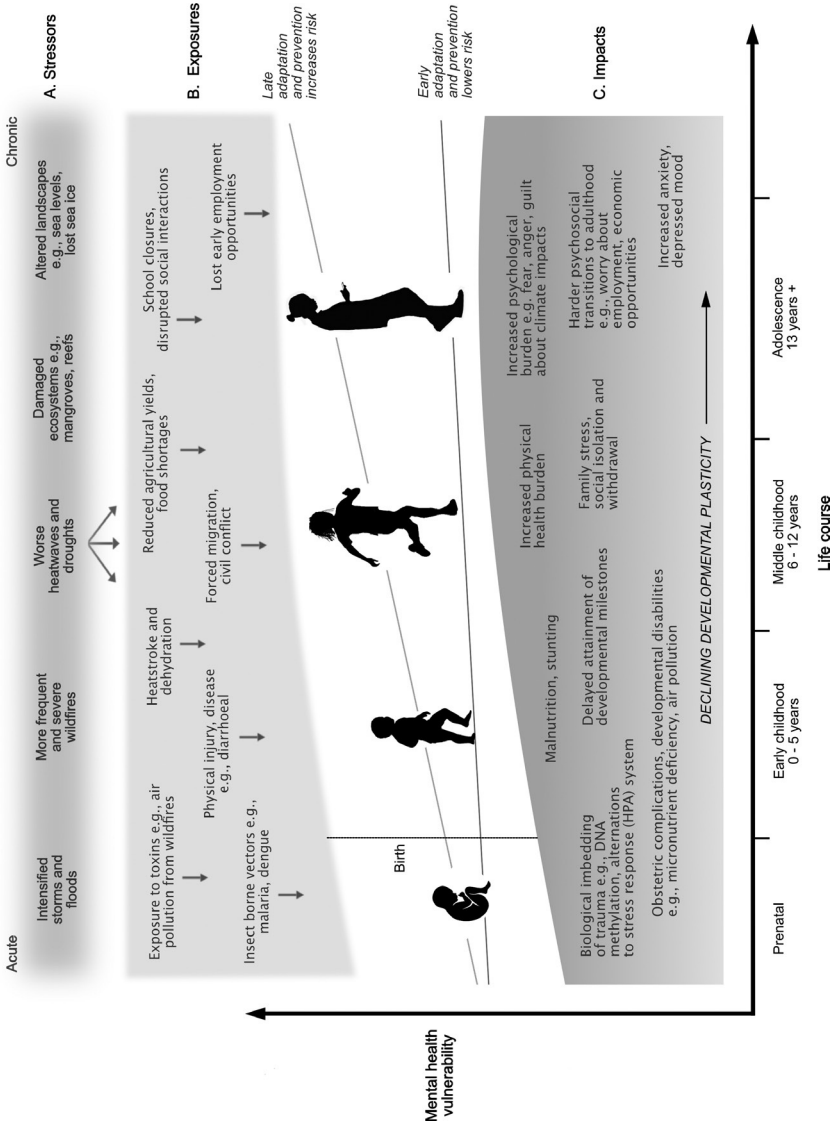


Figure 4-1 Pathways and processes linking climatic stressors to increased mental health vulnerability drawn from the empirical literature.

adverse developmental outcomes, including increased risk of neurodevelopmental and psychiatric disorders. In the context of climate change, climatic stressors can lead to direct and indirect exposures to trauma that harm the developing fetus (Figure 4.1). Exposures occurring during this period operate primarily through biological pathways that alter healthy neuropsychological development while psychosocial stressors occurring in other systems (e.g., mesosystem or macrosystems) are mediated by maternal and household factors such as family functioning.

One intuitive and well-studied prenatal risk factor is heat. Hotter average temperatures, and more severe and protracted heatwaves, are among the most well-documented consequences of global climate change. Heatwaves and hotter average temperatures increase the risk of obstetric complications, preterm birth, low birth weight, and still birth (McElroy et al., 2022; Samuels et al., 2022). Perinatal birth complications are a well-established risk factor for neurodevelopmental and psychiatric disorders such as attention deficit hyperactivity disorder, schizophrenia, mood disorders, and suicidal behaviors (Abel et al., 2010; Anderson et al., 2021; Orri et al., 2021). Another set of well-studied climatic stressors are severe weather events such as tropical storms, floods, droughts, and wildfires. These events can directly harm individuals, damage and destroy property and livelihoods, disrupt access to education and healthcare services, and reduce access to essential services. Exposures to acute stressors during pregnancy can trigger stress responses that alter embryonic and fetal development in ways that lead to dysregulation of the child's hypothalamic pituitary adrenal axis stress response system (Faravelli et al., 2012). Even if early stress doesn't lead to an increase in psychiatric disorders, it can contribute to delays in the attainment of developmental milestones, including language and cognitive development, which carry costs of their own, and are known to covary with mental health vulnerability (Evans, 2019; Laplante et al., 2004).

Climate change can also impact healthy psychological development through more indirect and slow-moving stressors – such as drought, food insecurity, displacement, and forced migration – which directly affect the mother, thus undermining pregnancy outcomes (Olson & Metz, 2020), and have longer-term effects on development after birth (see Figure 4.1). These stressors are initially mediated by parental factors, such as material and psychosocial resources, but increasingly have direct impacts, via the family (mesosystem), education (mesosystem), and community (exosystem) that the child inhabits.

*Early Childhood*

Early childhood, from 0 to 5 years, is a period of high vulnerability due to physiological immaturity, rapid neuropsychological development, and susceptibility to disease. Children establish strong emotional bonds with caregivers in the first years, followed by rapid language and cognitive development and growing social and emotional skills development. Threats from heat exposure, malnutrition, insect-borne vectors (e.g., malaria), and air-, water- and foodborne toxins are significant (Mangus & Canares, 2019; Sheffield & Landrigan, 2011). Early exposures directly alter healthy brain development through biological pathways (e.g., stress) and through increased physical health problems that delay the attainment of health development and increase lifetime psychopathology risk (Firth et al., 2019). Once established, maladaptive developmental trajectories lead to the accumulation of negative life events, such as low academic attainment, school incompleteness, and unemployment (Butler et al., 2014), which increase stress, erode psychological resilience, and undermine the accumulation of human capital for individuals and societies (Caspi et al., 1998; Mani et al., 2013).

Indirect and slow-moving climatic stressors – such as food shortages, civil unrest, displacement, and forced migration – can contribute to stressors that tax the resources and resilience of families and communities and drive poor health behaviors (e.g., inadequate diet and physical activity), which directly harm the child or undermine the quality of childrearing that can be offered (Smith & Pollak, 2020). These stressors can themselves increase other long-term impacts on children, such as child neglect and maltreatment, which are well-established risk factors for psychiatric disorders (McCrorry et al., 2022).

*Middle Childhood*

Middle childhood, from 6 to 12 years, remains a period of high developmental vulnerability. In addition to exposures that may have accrued during the prenatal or early childhood periods, middle childhood is characterized by new risks arising from growing psychosocial independence, including the formation of social relationships with peers, teachers, and the wider community, which are vulnerable to disruption. Acute disasters – such as storms, floods, and wildfires – are a principal pathway through which climate change will initially impact the mental health of young people and are associated with increased incidence of sleep problems, PTSD, substance



use, depression, and anxiety symptoms and disorders (Clemens et al., 2020; Noffsinger et al., 2012). Epidemiological studies show that prevalence rates for PTSD for children exposed to disasters range from 15–30 percent, and around half of those remain traumatized and symptomatic 18 months later (Alisic et al., 2014; McDermott et al., 2014). Furthermore, reviews of the disaster literature have found that children experience higher rates of severe mental health impairments compared to adults (29.6 percent vs 18.3 percent) and may be more vulnerable than are adults to storm-related PTSD (Norris et al., 2002; Stanke et al., 2012).

In addition to effects of direct climatic stressors, subacute and chronic stressors – such as drought, food insecurity, and economic precarity – can have downstream effects that disrupt the child’s education, leisure activities, and social support networks (Carnie et al., 2011). These experiences, especially when coupled with vulnerabilities caused by early adversities, can delay attainment of developmental milestones, disrupt the healthy transition to adolescence, and increase mental health vulnerability (Akresh, 2016; Garcia & Sheehan, 2016). During the middle childhood period, fears of catastrophe and loss and worry about climate change and its anticipated effects are likely to increase.

### *Adolescence*

The adolescent period, which runs from age 13 into early adulthood, is characterized by major physiological, emotional, and behavioral changes, and the onset of new psychiatric disorders peaks at this time (Paus et al., 2008). These changes are complemented by increasing psychosocial independence including the formation of a more stable personal identity, peer groups, independent interests, leisure activities, and increasing self-reliance. Vulnerability to the impacts of acute weather events remains high. Hotter average temperatures and heatwaves pose significant and ongoing threats across multiple functional domains: They erode sleep quality, reduce physical activity, increase aggressive behaviors, amplify depressive emotional sentiment, disrupt learning and cognitive test performance, and reduce high school graduation rates – even when the historically high temperatures cease to be socially remarkable (Minor et al., 2022). These events can interfere with education completion and delay the attainment of economic and social goals, such as employment, creating additional stress in the lives of young people.

Adolescents are more likely to be aware of, and to worry about, the impacts of climate change compared to other age groups. International

surveys show that adolescents and young people are highly concerned about the impacts of climate change (Hickman et al., 2021). A growing research literature shows that climate change elicits strong emotional responses including feelings of fear, anxiety, anger, frustration, and guilt, hopelessness, and despair (Ojala et al., 2021). Although there is no evidence yet that these states have a causal effect on rates of mental disorders, it is at least plausible that they interact with and exacerbate symptoms for already-existing disorders, and further work is needed to examine these relationships.

In summary, the literature reviewed above shows that a series of complex, interconnected, and interacting stressors, driven by climate change, are increasing mental health vulnerability of young people at every developmental phase from the start of life onwards. Impacts that occur early, or are severe, repetitive, or protracted, can and have cascading effects on development of mental health and well-being across the life course. Developmental approaches taken together, particularly when analyzed as complex systems, provide a framework for conceptualizing these relationships and guiding research development and can assist with response planning and policy development. In the following section, we draw on the developmental life course approach, with an emphasis on longitudinal studies, to highlight conceptual and methodological challenges on the road ahead.

## **Measuring and Responding to Climate Change**

### *Measurement Challenges*

The question of how to conceptualize and measure how climate change influences mental health poses unique challenges. For a start, the mismatch between timescales of climate change and human lifespans mean that most studies focus on the link between weather-related stressors and climate variability, rather than climate change per se (Massazza et al., 2022). Second, geophysics can only offer an estimate of the likelihood of climate change being responsible for any particular extreme event, such as a specific wildfire or flood. Nevertheless, attribution studies are increasingly convincing (Ebi et al., 2020), as is people's lived experience of their local weather patterns. Third, mental health problems are the product of long, interconnected causal chains that begin before birth, often interacting with the environment in complex ways to create feedback loops that cascade across development to deliver final outcomes. This picture

is further complicated by the fact that, in addition to direct impacts, climatic stressors frequently have indirect downstream effects that alter environments and human societies in myriad ways to increase mental health vulnerability, creating uncertainty about both pathways and mechanisms. One way to conceptualize the relationship between climatic stressors and the many domains of mental health that can be impacted is to apply a 'systems thinking' approach (Berry et al., 2018).

**Systems thinking** is a conceptual approach that considers causes and effects as interconnected, mutually reciprocal components of a system, nested within or overlapping other complex systems. The approach has particular appeal in the context of climate change because it can help to elucidate the complex interplay between climatic stressors, exposures, vulnerability, and mental health outcomes, and their reciprocal effects on the system in which they are embedded (Berry et al., 2018). Recent reviews show that the systems approach can be successfully applied to mapping the complex, multidimensional ways in which climate change shapes mental health (Gousse-Lessard et al., 2022; Hayward & Ayeb-Karlsson, 2021). Systems thinking can, equally, be used to map the relationships between climatic stressors and children's present and future mental health and well-being (see Figure 4.2).

Although efforts to **map** how climate change shapes mental health are already underway, a stronger developmentally sensitive approach is required. This means defining the key climatic stressors for different developmental periods, the regions in which impacts occur (e.g., locally, nationally, globally), and the populations that are most at risk – all under multiple climate change scenarios. It is vital to understand that children grow up in specific physical places; predictive analyses of the likely prevalence and course of mental health, and interventions that will work in the real world, must therefore be localized to be relevant and helpful. Such information will be essential for policy development and response planning in the short and long term. Interactions between mental and physical health should also be tracked and modeled, especially in low- and middle-income countries where children already carry a high health burden, and will increasingly do so, as climate changes advance (Firth et al., 2019). Mapping exercises should define and consider the multiple domains of mental health that climate change will shape for specific places. Consideration must include subclinical psychological distress, psychiatric disorders, hospital admissions, self-harm, and suicidal behaviors. Substance use problems, which are most prevalent among young people, and frequently co-occur and interact with mental health problems, should

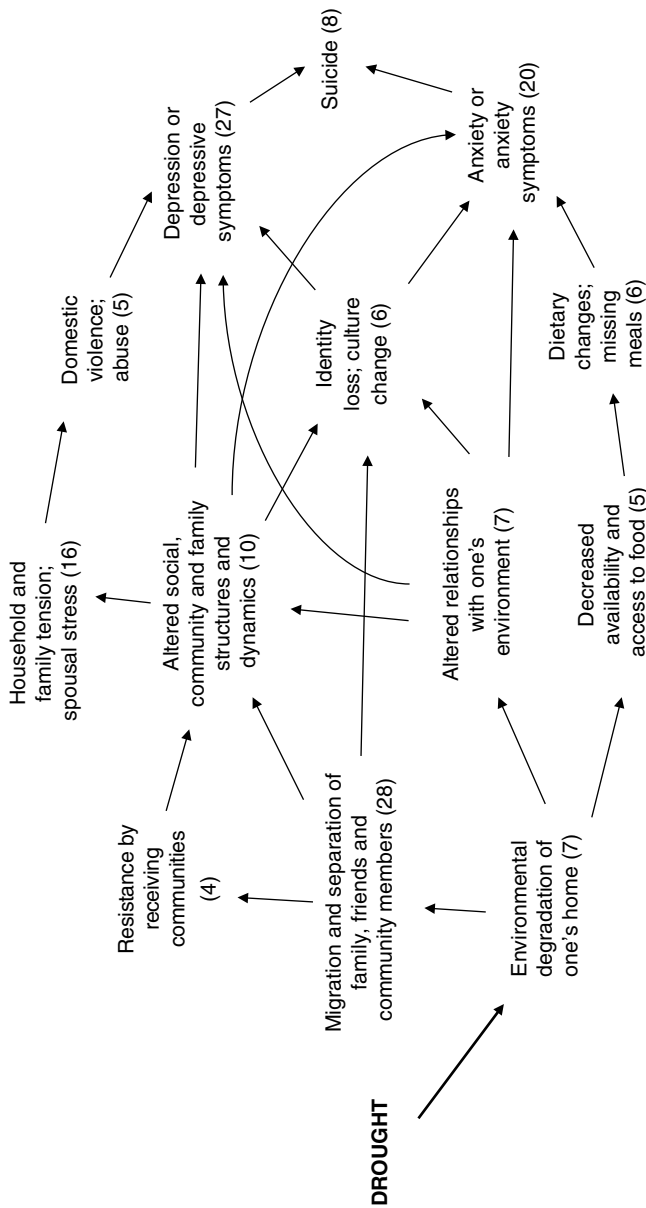


Figure 4.2 Example of systems approach used to examine the relationship between *one* climatic stressor, drought, and mental health through the environmental degradation of one's home.

be monitored and tracked as a key dimension of young people's mental health and well-being (Vergunst et al., 2022). So too should maladaptive behaviors that are harmful to others, such as interpersonal violence and terrorism.

Throughout this chapter we have emphasized the process of ongoing adaptation across the life course that characterizes mental health and illness. This implies a need for **long-term studies** that track normal and abnormal psychological process in response to climate change and its stressors across development (Nissan et al., 2021). We have previously argued for the use of birth cohort studies and long-term population registry data because they are already available and can be quickly leveraged through linkages with administrative data – for example, meteorological, health, genetic, education, and tax return data – to monitor development over long time periods (Vergunst & Berry, 2021). These methods should be further complemented with mixed methods, qualitative designs (e.g., to better understand young people's psychological responses to climate change), survey data, quasi experiments, and so on (see Textbox 4.2).

Another important piece of the response planning puzzle is to understand the **mechanisms** through which climatic stressors affect psychological development. Currently, evidence from both human and animal studies demonstrates a robust link between adverse early life experiences and negative developmental outcomes, but the physiological and neurocognitive process that underlie these effects are not well understood (Smith & Pollak, 2020). One suggestion is that attention should also be focused on questions about intensity, severity, chronicity, and developmental timing of climate change-related stressors. For instance, while prior research has focused on the 'first 1,000 days' as a period of especially high developmental vulnerability, more recent studies have challenged this measurement period, showing that adverse experiences in adolescence may have even larger negative effects on developmental outcomes, including mental health, when compared with equivalent experiences that occur in the early childhood periods (Huei-Jong et al., 2021; Woodard & Pollak, 2020). Addressing these unresolved questions would help to clarify key periods for targeted prevention efforts and inform climate adaptation policy development – and here again, specificity (who, what, when, *and where*) will be important. In summary, the arguments presented here, in conjunction with recent reviews of quantitative studies of climate change and mental health, show that conceptual and methodological innovation are needed to understand and measure the impacts of climate change on the psychological health and well-being of young people (Massazza et al., 2022).

**Textbox 4.2 Research priorities**

- Conduct impact-targeted systematic reviews of the scientific and grey literatures on the effects of climate change-related events on healthy psychological development across the life course
- Support interdisciplinary research on the effects of acute (e.g., wildfires, floods), subacute (e.g., heatwaves), and chronic (e.g., drought, food shortages) stressors on the cognitive, social, and emotional development of children across the world
- Examine how the intensity, severity, chronicity, and developmental timing of exposures influence the healthy psychological development of children (including additive, interactive, and cumulative effects)
- Clarify the mechanisms through which climate change-related stressors increase mental health vulnerability (e.g., disrupted sleep, lost education)
- Conduct cross-cultural studies on how children are adapting psychologically to climate change (e.g., fear, anxiety, guilt) and what they are doing to cope
- Evaluate how resilience can be promoted and vulnerability reduced at the individual and group levels so that children are equipped to live with climate change
- Identify existing and new research designs, analytic approaches, and data sources that can help address these questions in the immediate and long term (Vergunst & Berry, 2021)

*Responses to Improve Youth Mental Health*

Climate change is part of all future scenarios and young people today will not know a world without it. Adaptation will require deep changes that become so embedded in everyday ‘healthy living’ that they are no longer linked to the climate crisis. But getting there will be psychologically taxing; accepting what previous generations have done to the planet and what it means for our collective futures, and indeed the future of all sentient life, can generate powerful emotions. Much more work is needed to understand these processes in young people of all ages so that psychologically healthy adaptive processes can be realized. At a minimum, this will require recognizing these reactions as normal and healthy responses to events that are, in nearly every way, a predictable and preventable tragedy.

The most important responses to climate change, by far, will be the *collective* national and international responses to reduce greenhouse gas emissions, including the planning and implementation of effective adaptive strategies (Buse et al., 2022). Unfortunately, a recent review of the evidence on human adaptation to climate change reported that adaptations

are “largely fragmented, local and incremental, with limited evidence of transformational adaptation and negligible evidence of risk reduction outcomes” (Berrang-Ford et al., 2021, p. 989). Within the healthcare sector, nearly two-thirds of countries worldwide do not have adequate national health emergency frameworks and are unprepared to respond to climate-related health emergencies (Romanello et al., 2021). Furthermore, mental disorders already affect around 1 billion people worldwide – including around one in six children – and cost the global economy more than US\$1 trillion per year, yet account for just 2.1 percent of national healthcare expenditure (WHO, 2022). In short, substantial investment in response planning and mental health services are required to meet the mental health challenges faced by children.

At the levels of **individual and local community action**, more work is needed to understand how children and young people can most effectively adapt to living with climate change. This may not be achieved by constant bombardment of climate change-related news – which could, for vulnerable individuals, elevate the risk of posttraumatic stress symptoms (Dick et al., 2021) – and it is critical to engage young people in conceptualizing responses. Further work is also needed to establish age-appropriate “best practice” for improving young people’s engagement with climate change (Mah et al., 2020); employing a “**collective causes and collective solutions**” framing is more effective at generating proactive engagement than is a framing that emphasizes individual responsibility (Obradovich & Guenther, 2016). Some evidence indicates that young people who engage in climate change mitigative and adaptive efforts experience a mental health boost, and further study of these associations is warranted. Crucially, adults must facilitate and support young people’s efforts to engage and respond to climate change. This will mean learning how to help them participate in making and implementing decisions that will, after all, affect them most. Scaling up climate change education in school settings – for teachers as well as children – could be an effective strategy. Indeed, a recent review called for “the development of new forms of climate change education that directly involve young people in responding to the scientific, social, ethical, and political complexities of climate change” (Rousell & Cutter-Mackenzie-Knowles, 2020).

The **virtuous cycle** between effective responses to climate change and enhanced psychological well-being have yet to be fully realized. This means setting in motion responses and adaptive actions that have dual and mutually reinforcing benefits for climate change and mental health and well-being, such as promoting more active transport like walking and

cycling over motor vehicles, eating more plant-based diets rather than animal products, and so on. More broadly, we have argued elsewhere that we strongly favor community-based responses because they shift the onus from primarily the individual to primarily the group. We endorse a model of ‘preventive psychiatry’ that prioritizes investment in universal public health approaches targeting the social determinants of mental disorders (Braveman & Gottlieb, 2014; Fusar-Poli et al., 2021). This requires increased investment in education, employment, social support, housing, criminal justice, poverty alleviation, community development, greenspace, environmental protection, and immigration reform. The approach is strongly supportive of the global mental health and sustainable development goals which seek to improve global mental health while simultaneously tackling climate change and protecting the environment (Patel et al., 2018).

The **global injustice** of climate change has been repeatedly noted but is worth restating, partly because of the pernicious effect that climate change-related injustice itself has on mental health (Berry, 2022). Currently, around 89.3 percent of the world’s young people aged 0–24 years live in low- and middle-income countries, which are overwhelmingly located in equatorial regions that have been identified as being most at risk from climate change (UN, 2022). People living in these regions are currently and historically least responsible for causing climate change and are amongst the least resourced to adapt to the short-term shocks and enduring harm generated by climatic stressors. The global reach of climate change means that no country can fully insulate itself from its effects, especially in the long term (e.g., food shortages, forced migration). Effective global strategies to mitigate the worst harms (e.g., through rapid adaptation and prevention) are a rational necessity, to say nothing of the moral imperative. In practice, this means doing much more to support populations living in vulnerable regions, especially those currently and historically most disadvantaged, by buffering their response and adaptation capabilities. It should also be noted that inequality gradients exist within as well as between nations, and those living with complex disadvantage and marginalization in wealthier nations also require and merit effective support. Within this, the needed investment in adapting public health services for climate change must include developing and scaling up mental and general health services for young people (McGorry et al., 2022).

In planning policy activities and health interventions, we must remember that nearly all formal scientific knowledge about how climate change affects health has been generated by wealthy countries using data drawn from samples in their own nations – and is therefore not representative of



the global majority (Henrich et al., 2010). Nor is it representative of marginalized groups in wealthy nations. These within- and between-nations inequities must be acknowledged by those who inform, make, and implement decisions (e.g., governments, nongovernmental organizations, health agencies, researchers) so that more locally adapted, culturally informed measurement and mitigation strategies may be pursued (Zhang et al., 2021). Indeed, we must go beyond this to actively enable representative participation in decision-making about what to do and how to fund and implement decisions. These people, especially young people, have a moral right as well as a practical need to sit at the world's decision-making tables.

### Summary and Conclusions

Climate change presents major challenges to the mental health and well-being of young people. Its effects are already being observed across the world and are expected to accelerate as climate change advances. Even with swift and effective adaptive action, the reversal of important and hard-won human development goals now appears unavoidable, with disastrous consequences for health and well-being. We have shown that taking a developmental life course perspective offers a practical framework for understanding the pathways and processes through which this might occur, and can inform the development of age-appropriate, targeted harm prevention and health promotion strategies. The threat we face is overwhelming and urgent. But decision-making that is inclusive, just, well-informed and intellectually rigorous can lead not only to excellence in adaptive action but to changing the world for the better.

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